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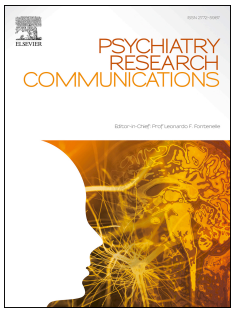

Early psychological health outcomes among United States healthcare professionals, essential workers, and the general population during the COVID-19 pandemic: The influence of occupational status

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Title: Early psychological health outcomes among United States healthcare professionals, essential workers, and the general population during the COVID-19 pandemic: The influence of occupational status

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Abstract:

The primary purpose of this study was to determine variations in psychological experiences of the COVID-19 pandemic among US healthcare workers, non-healthcare essential workers, and the general population. A cross-sectional survey was conducted online from June 22, 2020 to July 5, 2020, with 5,023 participants aged 18 years and older. The prevalence of fear of COVID-19 and symptoms of depression, anxiety, and posttraumatic stress disorder were evaluated, using the Fear of COVID-19 Scale, Patient Health Questionnaire-8, Generalized Anxiety Disorder-7, and Posttraumatic Diagnostic Scale. Generalized linear mixed-effects models were used to explore sociodemographic and COVID-19-related risk factors. Using models unadjusted for working status, it was found healthcare workers endorsed less fear of COVID-19, depression, and PTSD symptoms, than the general public. After adjusting for working status, no further significant differences were found between occupational groups. Across all psychological distress outcomes, those who were not working or were unemployed due to COVID-19 reported more symptoms than did individuals who continued to work from their normal location or remotely. A similar trend was found for nurses and physicians, with members of both groups reporting symptoms of depression, anxiety, and PTSD less when working from their normal location than when unemployed due to COVID-19.

Keywords: COVID-19 fear, PTSD, anxiety, depression

1. Introduction

The US has been severely affected by the coronavirus 2019 (COVID-19) pandemic. The pandemic's rapid spread, as well as mitigation strategies implemented to curb its spread (school and business closures, social distancing measures, stay-at-home orders),[1] have had a devastating impact on the social, physical, financial, and psychological well-being of individuals and communities worldwide.[2,3] COVID-19-related stressors for the general public include fear of being infected, disrupted access to critical supplies (eg, due to restricted business hours of stores/supermarkets), loss of employment or income, frequent changes/contradictions in official guidelines, loneliness due to lack of in-person social contact during quarantine or stay-at-home orders, "Zoom fatigue," and "mitigation fatigue."[4,5]

Healthcare workers may be particularly at risk for detrimental psychological effects through increased clinical workloads, prolonged absence from loved ones, escalation of service needs beyond staffing levels, ability to cope, inadequate supply of personal protective equipment (PPE), and high personal risk of infection resulting in quarantine or serious illness for themselves or their family unit.[6] Evidence of psychological health outcomes from previous epidemics and pandemics such as severe acute respiratory syndrome (SARS),[7,8] Middle East respiratory syndrome (MERS),[9] H1N1 influenza,[10,11] and Ebola,[12] as well as data emerging from the COVID-19 pandemic[13–15] support this hypothesis specific to depression, anxiety and/or post-traumatic stress disorder. For example, health care workers treating SARS patients had higher levels of burnout, distress and posttraumatic stress symptoms as compared to health care workers that did not treat SARS patients[7] and similar trends were observed in posttraumatic stress disorder in health care workers that treated MERS.[9]During the H1N1 influenza pandemic, health care workers reported moderately high anxiety, especially in regards to possibly infecting loved

ones.[10] And with the advent of COVID-19, some of the earliest studies of health care workers in China found at least one third had subthreshold mental health disturbances, although those healthcare workers with increased exposure to COVID-19 had increased levels of mental health distress.[13]

Heightened risk of COVID -19-related psychological distress is likewise expected among individuals identified as non-healthcare essential workers (e.g., grocery store staff, transportation workers),[16] whose occupations require exposure risks while sustaining "operations/services typically essential to continued infrastructure viability."[17] Like healthcare workers, non-healthcare essential workers worry about their risk of infection, the possibility that they might expose members of their household, the quantity/quality of PPE supplies, and extended or more frequent work shifts, in addition to the social isolation that affects communities more generally.

The COVID-19 pandemic has impacted both healthcare and non-healthcare industries,[18, 19]with effects spanning work location, work intensity, and overall job security. This factor may be particularly relevant in the US, where access to health insurance is tied closely to employment, particularly because employment stability during the pandemic has been more labile in the US compared with other developed nations.

In the current pandemic, scientific inquiry into factors related to psychological well-being during pandemics is warranted to learn how individuals are impacted differently. Data on the early psychological health outcomes associated with work status among healthcare professionals, essential workers, and the general population during the COVID-19 pandemic can contribute insights for policy and intervention planning.[20 21] Here, we examine variations in psychological experiences of the COVID-19 pandemic among US healthcare workers, non-healthcare essential workers, and the general population, as well as the factors associated with those variations

For this investigation, we hypothesized that healthcare workers would experience pandemic-associated depression, anxiety, and posttraumatic stress more than would other essential workers or the general population because of direct exposure to patient care. We also hypothesized that fear of COVID-19 would manifest among healthcare workers more than among those other groups.

2. Methods

2.1 Study Design

This was a cross-sectional observational survey-based study. The study protocol was approved by the Institutional Review Board at Baylor Scott and White Research Institute

2.2 Study Sample and Data Collection

Data were obtained from respondents across the US, using an online questionnaire administered via the Qualtrics survey platform[22] . Participants from the Qualtrics market research panel were recruited to achieve sufficient representation of diverse ages, genders, geographies, and occupations interfacing with the pandemic. Prospective participants were adults aged 18 years and older with sufficient mastery of English to complete the questionnaire.

To ensure comprehensive capture of the pandemic's impact on the emotional well-being of frontline workers and facilitate meaningful comparisons between occupational types, we stratified the sample to comprise 40% healthcare workers, 30% non-healthcare essential workers, and 30% general population. Healthcare workers included physicians, nurses, pharmacists, physical therapists, occupational therapists, social workers, optometrists, speech pathologists, chiropractors, home health workers, and nursing assistants. Non-healthcare essential workers included food and agriculture personnel (ie, grocers, convenience store workers, restaurant

employees, farmers, and farmworkers), transportation and logistical service providers, law enforcement, public safety personnel, and other first responders.

The online questionnaire was distributed over 2 weeks from June 22nd to July 5th, 2020. The survey platform was configured à priori with appropriate "speed check" criteria that ensured automatic deletion of responses from participants who filled out the questionnaire at an implausible speed. Questionnaires returned with incomplete/insufficient responses were eliminated from final analyses. Of 6,461 initial surveys sent, 1,438 did not meet data quality measures, leaving 5,023 for analysis.

2.3 Study Measures

Patient Health Questionnaire 8 (PHQ-8): The PHQ-8 is a brief 8-item self-report measure of depressive disorders, with established validity/reliability in both the general and clinical populations.[23] The PHQ-8 has proved to be a valid, reliable measure of depressive symptoms specifically during the COVID-19 pandemic.[24] Participants rate how frequently they have been bothered by specific symptoms over the past 2 weeks, on a 4-point scale. A cutoff score of ≥10 shows 88% sensitivity and 88% specificity in discriminating probable depression.[25] We applied this cutoff score to dichotomize our sample into respondents with or without probable depression.

Generalized Anxiety Disorder 7-item Scale (GAD-7): The GAD-7 screens for generalized anxiety disorder. Respondents rate how frequently they have been bothered by each of 7 symptoms over the past 2 weeks, on a 4-point scale. The cutoff threshold of ≥10 has 89% sensitivity and 82% specificity in discriminating probable anxiety.[26] Using this cutoff score, we dichotomized our study sample into respondents with or without probable anxiety.

Posttraumatic Diagnostic Scale for DSM-5 (PDS-5): This 20-item self-report measure of posttraumatic stress applies criteria from the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders*. Consistent with recommendations, we used a cutoff score of ≥28 to dichotomize the study sample into respondents with or without likely PTSD.[27]

Fear of COVID-19 Scale (FCV-19S): The Fear of COVID-19 Scale's 7 items measure perceived fear due to the COVID-19 virus, with scores ranging from 7 to 35; higher scores indicate greater fear of COVID-19.[28] The internal consistency of the FCV-19S in our sample was excellent (Cronbach's $\alpha = 0.92$).

Coronavirus Impact Scale: Two of the 9 items on the Coronavirus Impact Scale were used in this analysis.[29] On those 2 items, respondents rated the impact of the pandemic on their family income/employment as well as on food access, using a severity scale from 0 to 3. For this analysis, only participants who identified as physicians or nurses were used.

COVID-19 Occupational Risk: Healthcare workers' willingness to help patients with COVID-19 was assessed with a single item adapted from a scale utilized during the previous SARS outbreak to assess practitioners' altruistic acceptance of risk.[30] Physicians and nurses rated their agreement with the statement "Because I wanted to help those impacted by COVID-19, I was willing to accept the risk involved," with response choices "yes," "no," or "prefer not to answer." This analysis, included only participants who identified as physicians or nurses.

Employment Status: Employment status was the principal independent (predictor) variable. Respondents self-reported their current employment status using the following criteria: "working from normal location," "working from home," "not working right now due to COVID-19," "unemployed right now due to COVID-19," and "not working for other reasons" (eg, as a student) unrelated to COVID-19.

Community Data: Publicly available county-level data for COVID-19 cumulative seropositive status and COVID-19 death counts per 100,000 population were extracted to contribute a community-level context for participants' responses.

2.4 Statistical Analysis

The primary analysis compared psychological outcomes related to COVID-19 across three occupational groups: (1) healthcare workers; (2) non-healthcare essential workers; and (3) the general public. Participants' characteristics were compared across groups using analysis of variance (ANOVA) for age, Kruskal-Wallis non-parametric tests for COVID-19 community-level seropositive status and death counts, and chi-square tests of proportions for categorical variables. Fear of COVID-19 was analyzed using a mixed-effects general linear model. Psychological outcomes (PHQ-8, GAD-7, and PDS-5) were analyzed both as continuous scale scores using mixed-effects general linear models and as dichotomized outcomes using mixed-effects generalized linear models with a binomial distribution and a logit link function.

Risk-adjusted models were fitted to each outcome in two ways. The first set controlled for covariates such as age, gender, race/ethnicity, marital status, education, current psychological diagnosis, and logarithm of county-level COVID-19 cumulative seropositive case and death counts per 100,000 population, as fixed effects. A random effect was incorporated to account for state-level clustering. The second set of models assessed the association between occupation group and each study outcome, independent of current working status. These models adjusted for all covariates included in the first set of models, and additionally controlled for working status. Global differences across occupation groups were first assessed using Type III likelihood ratios. If overall differences were statistically significant at the $\alpha = 0.05$ level, all pairwise comparisons were analyzed via contrast statements to determine specifically which groups differed

significantly from one another. The *P*-values for pairwise comparisons were adjusted using the Benjamini–Hochberg method.[31]

Additionally, we report risk-adjusted associations between current working status and each outcome as assessed by regression beta (β) coefficients or odds ratios relative to "working at my normal location" as the reference group. *P*-values for these analyses were also adjusted using the Benjamini–Hochberg method.

Subgroup analysis for nurses and physicians was also performed to determine whether there were associations between working status and each outcome. Due to smaller sample sizes within each working status group, ANOVA was used to compare across total scores, and Fisher's exact tests were used for dichotomized outcomes. Finally, for nurses and physicians, the selected items from the Coronavirus Impact Scale and COVID-19 Occupational Risk measures were summarized descriptively using means and standard deviations or counts and percentages. All analyses were performed using SAS version 9.4 (SAS Inc., Cary, NC) with significance for statistical tests set at $\alpha = 0.05$.

3. Results

Of the 6,461 initial surveys sent 1,438 did not meet data quality checks and were excluded; 5,023 remained for analysis. The average age of respondents was 49.9 years (±14.3); 44% were 55 years or older (Table 1). The majority were female (59%), identified as non-Hispanic Whites (74%), married or living with a partner (56%), with a bachelor's degree or higher (59%). At the time of completing the survey, 50% were working from their usual locations, 25% were working from home, 12% were either not working or unemployed due to

COVID-19, and 12% were not working due to other reasons. There were statistically significant differences across demographics (eg, age, sex, race/ethnicity, marital status, education level) and work status between occupation groups. Non-healthcare essential workers were the youngest and had the highest percentage of males (64%); healthcare workers had the lowest percentage of males (25%). Healthcare workers were more likely to be married and also had the highest levels of education. The general population group was the most diverse in race/ethnicity and also had the lowest percentage of responders working from their normal locations.

3.1 Unadjusted Psychological Outcomes

All respondents completed the FCV-19S, with a mean score (± SD) of 17.4 (± 6.7) which was associated with ear of COVID-19.[25] The GAD-7 measure for anxiety was completed by 5,000 respondents (95.5%), with 14% reaching the clinical cutoff for probable anxiety. The PHQ-8 was completed by 5,004 respondents (95.6%), with 16% meeting criteria for probable depression. The PDS-5 was completed by 4,928 respondents (98.1%), with 6% reaching the clinical cutoff for probable PTSD. There was no significant difference in missing data rates across occupation categories for any of the psychological measures (Table 2).

3.2 Risk-adjusted Models

Models that did not adjust for working status found a significant multivariate association between one's occupation group and fear of COVID-19 ($P = 0.015$), PHQ-8 total score ($P = 0.019$), and PDS-5 score ≥28 ($P = 0.037$) (Table 4). For fear of COVID-19 and total PHQ-8 scores, pairwise comparisons showed significant differences between healthcare workers and the general population, with the former endorsing fewer symptoms for both outcomes. For the PDS-

5 dichotomized outcome, no significant intergroup differences remained after the *P*-values were adjusted for multiple comparisons.

Once current working status was incorporated into multivariable models, no further significant differences were observed between occupational groups. Table 5 illustrates the independent influence of working status on each outcome. Across all psychological distress outcomes, those who either were not working or were unemployed due to COVID-19 rated themselves as experiencing more frequent symptoms than did individuals who continued to work from their normal locations. For fear of COVID-19 and total PHQ-8 scores, responders who were compelled to work from home also reported significantly more frequent adverse symptoms than did counterparts who continued working from their normal location. Responders who were not working due to other reasons (unrelated to COVID-19) endorsed PTSD symptoms at higher rates, both as total PDS-5 scores and as binary "likely" vs "unlikely" PTSD outcomes, than those for individuals who continued working at their normal locations.

To assess for the potential of heightened risk of COVID-19-related psychological distress as expected among individuals with occupational exposure for risk of infection, subgroup analyses were conducted to determine the association of working status with perceived fear of COVID-19, depression, anxiety, and posttraumatic stress symptoms specifically among physicians and nurses. As shown in Table 6, nurses who were unemployed as a result of the COVID-19 pandemic experienced statistically significant (all $P < 0.05$) higher levels of depression (32.5%), anxiety (33.5%) and posttraumatic stress symptoms (13.2%) than did their counterparts working at their usual locations. An identical trend was found in physicians (clinical depression prevalence rates increased by 34.1%, probable anxiety by 37.1%, likely PTSD by 19% among unemployed vs physicians working at their usual locations). In contrast, we detected

no significant independent association between perceived fear of COVID-19 and working status among nurses ($P = 0.165$) or physicians ($P = 0.333$).

Physicians and nurses were also asked two questions regarding COVID-19 impact as well as an individual question on desire to help despite the potential risk. As shown in Table 6, nurses who were not working or were unemployed due to the COVID-19 pandemic reported moderate to severe impact on family income and employment (52.6% and 54.5%). The majority of nurses (57.9% and 81.8%) in the latter groups nevertheless endorsed their willingness to accept the risks of providing care for patients with COVID-19 out of an altruistic desire to help. Physicians in the not working/unemployed groups also endorsed moderate to severe impact on family income and employment (46.7% and 40%). Likewise, a majority (60%) of both groups of physicians reported that they would still be willing to accept the risks involved, because they wanted to help those impacted by COVID-19.

4. Discussion

In this analysis of 5,023 healthcare workers, non-healthcare essential workers, and members of the general US population, we found that occupational differences did not account for differences in mental health outcomes. Contrary to our prediction that healthcare workers would experience the most psychological distress across occupational groups, the data did not support this. Our findings did suggest important differences regarding working status, regardless of occupation type. Individuals not working or unemployed due to COVID-19 were at the highest risk for anxiety, depression, posttraumatic stress symptoms, and fear of COVID-19, whereas those working from home and/or working at their normal location were at lowest risk.

Possible explanations for results/underlying mechanisms

Further examination of the impact of working status among physicians and nurses revealed significantly higher rates of clinically suggestive anxiety, depression, and PTSD in nurses and physicians unemployed due to COVID-19. However, the numbers of physicians and nurses included in the study were insufficient to perform additional multivariate modeling. Regardless, this research suggests that there may be a protective effect for physicians and nurses to be able to work despite potential risks. When asked, 74% of nurses and 81% of physicians endorsed that they were willing to accept the risks because they wanted to help those impacted by COVID-19. It is possible that the ability to work in their normal locations and/or at home reduced psychological distress due to the larger altruistic tendencies of wanting to provide help in comparison with those who were no longer able to be actively engaged in their professional roles due to the pandemic. Alternatively, they may have felt a loss of control or purpose, even in the setting of a pandemic with uncertain course. Finally, previous research shows that both unemployment[32] and working from home[33] are associated with increased psychological distress in the general population (regardless of occupation).

Comparison to the literature

Several studies have reported adverse mental health effects of the COVID-19 pandemic among healthcare workers,[34-36] but few have compared psychological impacts between healthcare workers, non-healthcare essential workers, and the general population. A meta-analysis identified 4 studies from China and 1 from Singapore that included such a comparison; in the pooled results from those studies, there were no statistically significant differences between healthcare workers and non-healthcare workers on depression, anxiety, PTSD, or occupational stress although healthcare workers did experience insomnia to a greater degree.

In healthcare workers, changes in work location (eg, work from home) were associated with trends toward a higher prevalence of psychological symptoms. Nurses working from home instead of in their normal locations exceeded their professional counterparts on every measure: greater fear of COVID-19; likely depression, 13% vs 17% home; likely anxiety, 12% vs 15% home; and likely PTSD, 5% vs 10% home. Physicians working from home instead of at their normal locations exceeded their peers as well: fear of COVID-19, 15.7 vs 17.8 home; likely depression, 6% vs 15% home; likely anxiety, 3% vs 5% home, and likely PTSD, 1% vs 5% home.

Limitations

This study relied on a self-report survey and does not account for preexisting diagnoses. Further information regarding the sample was previously published by Warren et al.[22] However, findings related to fear of COVID-19 are not adversely affected by these limitations. Furthermore, nationally representative results spanning healthcare workers, non-healthcare essential workers, and the general US public, using psychometrically validated instruments, contribute insight into early psychological health outcomes with a focus on the influential role of occupational status during COVID-19, which have not been reported previously.

Implications for future research/practice/policy

Longitudinal evaluations of psychological health outcomes paired with employment status could yield actionable insights to employers, policymakers and mental health professionals to address shifts in the prevalence of anxiety, depression, and PTSD across the workforce in the US. In the future, insights from the resiliency of engaged healthcare workers may help inform additional studies to inform strategic decisions in mitigating risk for other professions, for example school teachers.

4.1 Conclusions

The results of this survey reflect mental health symptoms were present in a nationally representative survey across job types during the early phases of the COVID-19 pandemic in the US. Some characteristics, such as work status (eg, not employed) were associated with higher prevalence of psychological symptoms.

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Table 1. Demographics

	Overall (n= 5,022)	General Public (n = 3,103)	Healthcare Workers (n = 1,419)	Essential Workers (n = 501)	*P*
Age	49.9 ± 14.3	50.2 ± 14.8	50.0 ± 13.1	47.7 ± 14.1	<0.001
18-34	933 (18.6%)	601 (19.4%)	222 (15.6%)	110 (22.0%)	
35-54	1895 (37.7%)	1108 (35.7%)	586 (41.3%)	201 (40.1%)	
55+	2195 (43.7%)	1394 (44.9%)	611 (43.1%)	190 (37.9%)	
Sex					<0.001
Male	2042 (40.7%)	1367 (44.1%)	355 (25%)	320 (63.9%)	
Female	2960 (58.9%)	1720 (55.4%)	1061 (74.8%)	179 (35.7%)	
Race/Ethnicity					<0.001
White	3724 (74.1%)	2232 (71.9%)	1100 (77.5%)	392 (78.2%)	
Black	392 (7.8%)	260 (8.4%)	91 (6.4%)	41 (8.2%)	
Hispanic	376 (7.5%)	277 (8.9%)	75 (5.3%)	24 (4.8%)	
Asian	359 (7.1%)	224 (7.2%)	111 (7.8%)	24 (4.8%)	
Other	172 (3.4%)	110 (3.5%)	42 (3.0%)	20 (4.0%)	
Marital Status					<0.001
Single	1547 (30.8%)	1034 (33.3%)	352 (24.8%)	161 (32.1%)	
Married/common law	2806 (55.9%)	1646 (53%)	875 (61.7%)	285 (56.9%)	
Divorced/separated	630 (12.5%)	394 (12.7%)	181 (12.8%)	55 (11.0%)	
Unknown/prefer not to answer	40 (0.8%)	29 (0.9%)	11 (0.8%)	0 (0%)	
Highest Education					<0.001
Did not finish high school	40 (0.8%)	34 (1.1%)	2 (0.1%)	4 (0.8%)	
High school graduate / GED	615 (12.2%)	453 (14.6%)	54 (3.8%)	108 (21.6%)	
Some college, Associate's degree, vocational/technical school	1,401 (27.9%)	820 (26.4%)	370 (26.1%)	211 (42.1%)	
Bachelor's degree	1,648 (32.8%)	1,059 (34.1%)	454 (32.0%)	135 (26.9%)	
Graduate degree	1,299 (25.9%)	725 (23.4%)	532 (37.5%)	42 (8.4%)	
Unknown	20 (0.4%)	12 (0.4%)	7 (0.5%)	1 (0.2%)	

Currently Diagnosed with a Psychological Condition					0.525
Yes	683 (13.6%)	426 (13.7%)	197 (13.9%)	60 (12.0%)	
No	4276 (85.1%)	2639 (85.0%)	1202 (84.7%)	435 (86.8%)	
Prefer not to answer	64 (1.3%)	38 (1.2%)	20 (1.4%)	6 (1.2%)	
COVID-19 cases per 100,000 residents[1] median (Q1, Q3)	473 (251, 889)	471 (254, 886)	475 (251, 916)	468 (235, 890)	0.631
COVID-19 deaths per 100,000 residents[1] median (Q1, Q3)	15.0 (6.0, 48.0)	14.7 (5.9, 48.5)	17.2 (6.1, 55.0)	14.7 (6.1, 43.2)	0.272
Current Work Status					<0.001
Working from home	1256 (25.0%)	1012 (32.6%)	216 (15.2%)	28 (5.6%)	
Working at my normal location	2539 (50.5%)	1142 (36.8%)	1050 (74.0%)	347 (69.3%)	
Not working right now due to COVID-19	356 (7.1%)	225 (7.3%)	62 (4.4%)	69 (13.8%)	
Unemployed right now due to COVID-19	227 (4.5%)	160 (5.2%)	33 (2.3%)	34 (6.8%)	
Not working right now for other reasons	622 (12.4%)	548 (17.7%)	54 (3.8%)	20 (4.0%)	
Prefer not to answer	23 (0.5%)	16 (0.5%)	4 (0.3%)	3 (0.6%)	

[1]COVID-19 counts are based on cumulative county-level data as of June 22, 2020.

Table 2. Fear and psychological measures by occupation

	Overall (n = 5,022)	General Public (n = 3,103)	Healthcare Workers (n = 1,419)	Essential Workers (n = 501)
COVID-19 Fear Total	17.4 ± 6.7	17.6 ± 6.8	16.8 ± 6.2	17.2 ± 7.1
GAD-7				
Total score	4.0 ± 5.2	4.1 ± 5.4	3.7 ± 4.6	4.2 ± 5.5
Likely anxiety (score ≥ 10)	716 (14.3%)	471 (15.3%)	164 (11.6%)	81 (16.2%)
PHQ-8				
Total score	4.5 ± 5.5	4.6 ± 5.7	4.0 ± 4.9	4.7 ± 5.7
Likely depression (score ≥ 10)	4,197 (16.1%)	538 (17.4%)	179 (12.6%)	90 (18%)
PDS-5				
Total score	4.7 ± 11.5	4.8 ± 11.9	4.1 ± 10.2	5.3 ± 11.8
Likely PTSD (score >28)	300 (6%)	206 (6.8%)	65 (4.6%)	29 (5.9%)

Table 3. Fear and psychological measures by working status

	Working from Normal Location (n = 2,539)	Working from home (n = 1,256)	Not working right now due to COVID-19 (n = 356)	Unemployed right now due to COVID-19 (n = 227)	Not working right now for other reasons (n = 622)
COVID-19 Fear Total	16.6 ± 6.6	17.9 ± 6.6	18.3 ± 7.0	19.7 ± 6.8	17.9 ± 6.5
PHQ-8					
Total score	3.9 ± 5.1	4.6 ± 5.5	5.8 ± 6.1	6.9 ± 6.2	4.7 ± 5.9
Likely depression (score ≥10)	331 (13.1%)	206 (16.5%)	80 (22.5%)	72 (32%)	114 (18.4%)
GAD-7					
Total score	3.6 ± 4.8	4.0 ± 5.2	5.0 ± 6.0	6.5 ± 6.2	4.1 ± 5.8
Likely anxiety (score ≥10)	304 (12%)	176 (14.1%)	70 (19.7%)	65 (29%)	98 (15.9%)
PDS-5					
Total score	3.6 ± 9.5	4.5 ± 11.2	7.1 ± 14.2	9.1 ± 15.9	6.4 ± 14.5
Likely PTSD (score >28)	106 (4.2%)	73 (5.9%)	34 (9.7%)	30 (13.4%)	57 (9.4%)

Table 4. Regression results for comparison across occupation groups

	Not Adjusting for Work Status			Adjusting for Work Status	
	Global Difference Between Occupation Groups, *P*	**Beta/Odds Ratio[1] (95% CI)**	**Adjusted *P* for pairwise comparisons[2]**	**Global Difference Between Occupation Groups, *P***	**Beta/Odds Ratio (95% CI)**
COVID-19 Fear	0.015			0.434	
Healthcare vs. general public		-0.26 (-0.98, 0.45)	<0.001		-0.27 (-0.67, 0.13)
Essential workers vs. general public		-0.63 (-0.94, -0.33)	0.439		-0.09 (-0.88, 0.71)
Healthcare vs essential workers		-0.37 (-1.11, 0.37)	0.439		-0.19 (-0.94, 0.56)
GAD-7					
Total	0.079			0.560	
Healthcare vs general public		-0.30 (-0.55, -0.06)			-0.12 (-0.39, 0.15)
Essential workers vs general public		-0.25 (-0.70, 0.21)			-0.24 (-0.71, 0.23)
Healthcare vs essential workers		-0.06 (-0.46, 0.35)			0.12 (-0.3, 0.54)
Likely anxiety (score ≥10)	0.105			0.369	
Healthcare vs general public		0.82 (0.68, 0.98)			0.89 (0.72, 1.09)
Essential workers vs general public		0.86 (0.66, 1.12)			0.85 (0.65, 1.12)
Healthcare vs essential workers		0.95 (0.70, 1.27)			1.04 (0.76, 1.42)
PHQ-8					
Total	0.019			0.364	
Healthcare vs general public		-0.44 (-0.7, -0.17)	0.004		-0.23 (-0.53, 0.08)
Essential workers vs general public		-0.08 (-0.58, 0.41)	0.743		-0.08 (-0.59, 0.43)
Healthcare vs essential workers		-0.35 (-0.81, 0.10)	0.189		-0.15 (-0.61, 0.32)
Likely depression (score ≥10)	0.072			0.475	
Healthcare vs general public		0.78 (0.64, 0.95)			0.87 (0.69, 1.10)
Essential workers vs general public		0.91 (0.72, 1.16)			0.92 (0.72, 1.17)

Healthcare vs essential workers		0.86 (0.64, 1.16)			0.95 (0.70, 1.28)
PDS-5					
Total	0.155			0.761	
Healthcare vs general public		-0.55 (-1.12, 0.02)			0.09 (-0.50, 0.68)
Essential workers vs general public		0.14 (-1.00, 1.27)			0.42 (-0.72, 1.56)
Healthcare vs essential workers		-0.69 (-1.84, 0.47)			-0.33 (-1.49, 0.83)
Likely PTSD (score >28)	0.037			0.381	
Healthcare vs general public		0.72 (0.53, 0.98)	0.094		0.89 (0.63, 1.25)
Essential workers vs general public		0.66 (0.43, 1.02)	0.094		0.72 (0.45, 1.16)
Healthcare vs essential workers		1.09 (0.62, 1.91)	0.762		1.23 (0.70, 2.17)

All models controlled for age, sex, race/ethnicity, marital status, education, current psychological diagnosis, and the log COVID-19 case and death counts per 100k county population. A random effect was used to account for state-level clustering.

[1]Beta coefficients are reported for analysis of total scores, and odds ratios are reported for analysis of dichotomized outcomes.

[2]Pairwise *P*-values were calculated only if there was an overall significance between groups. Adjustments were made using the Benjamini–Hochberg method.

Table 5. Regression results for associations with current work status

Current Working Location	COVID-19 Fear Beta for total score (95% CI)	*P*	GAD-7 Beta for total score (95% CI)	*P*	PHQ-8 Beta for total score (95% CI)	*P*	PDS-5 Beta for total score (95% CI)	*P*
Working at my normal location	reference		reference		reference		reference	
Working from home	1.04 (0.38, 1.69)	0.003	0.36 (-0.03, 0.75)	0.096	0.44 (0.14, 0.75)	0.006	1.04 (0.17, 1.92)	0.200
Not working right now due to COVID-19	1.40 (0.83, 1.98)	<0.001	1.18 (0.57, 1.79)	<0.001	1.58 (0.96, 2.20)	<0.001	2.9 (1.66, 4.14)	<0.001
Unemployed right now due to COVID-19	2.60 (1.24, 3.96)	<0.001	2.49 (1.53, 3.44)	<0.001	2.29 (1.3, 3.28)	<0.001	5.26 (2.96, 7.56)	<0.001
Not working right now for other reasons	0.38 (-0.43, 1.18)	0.361	0.16 (-0.34, 0.66)	0.530	0.21 (-0.34, 0.76)	0.457	2.03 (0.92, 3.14)	<0.001
			Odds Ratio for total ≥10 (95% CI)		Odds Ratio for total ≥ 10 (95% CI)		Odds Ratio for total > 28 (95% CI)	
Working at my normal location			reference		Reference		reference	
Working from home			1.16 (0.93, 1.45)	0.262	1.23 (1.00, 1.51)	0.063	1.37 (0.92, 2.06)	0.124
Not working right now due to COVID-19			1.71 (1.32, 2.22)	<0.001	1.85 (1.35, 2.54)	<0.001	2.34 (1.46, 3.75)	0.001
Unemployed right now due to COVID-19			2.78 (1.86, 4.16)	<0.001	2.77 (1.74, 4.40)	<0.001	3.70 (1.81, 7.56)	0.001
Not working right now for other reasons			1.03 (0.75, 1.42)	0.848	1.14 (0.80, 1.60)	0.469	1.89 (1.17, 3.05)	0.012

All models controlled for age, sex, race/ethnicity, marital status, education, current psychological diagnosis, and the log COVID-19 case and death count per 100k county population. A random effect was used to account for state-level clustering. *P*-values were adjusted using the Benjamini–Hochberg method.

Highlights

- Differences exist in psychological distress in healthcare workers, essential workers and the general public as a result of the COVID-19 pandemic
- Work status accounted for the variance in psychological outcomes across groups, with healthcare workers reporting the least psychological distress
- Regardless of work type, individuals who were not working or unemployed due to COVID-19 had significantly higher rates of anxiety, depression, PTSD symptoms, and COVID-19 fear than did those working (at their normal location or remotely).

October 7, 2021

Author Statement

In regards to the manuscript, *Early psychological health outcomes among United States healthcare professionals, essential workers, and the general population during the COVID-19 pandemic: The influence of occupational status* this work has not previously been published elsewhere and is not under consideration at any other journal. We have recently published an article from the same dataset (Warren AM, Kiumars Zolfaghari K, Fresnedo M, et al. Anxiety sensitivity, COVID-19 fear, and mental health: results from a United States population sample. 2021. *Cognitive Behaviour Therapy*, DOI: 10.1080/16506073.2021.1874505). All authors agree with the revision.

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